



**Six-Month Evaluation
of Extended-Wear Soft
Contact Lenses Among Armored Troops
Part II:
Subjective Responses by Patients
(Reprint)**

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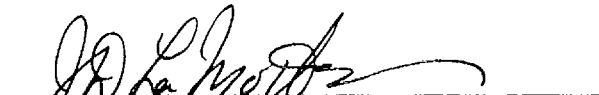
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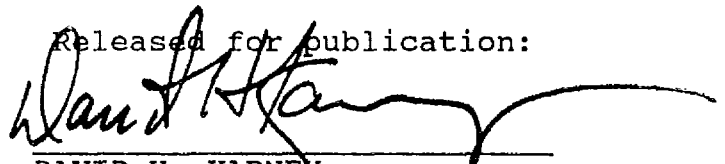


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Six-Month Evaluation of Extended-Wear Soft Contact Lenses Among Armor Troops. Part II: Subjective Responses by Patients

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ABSTRACT

This report addresses subjective patient responses to wearing contact lenses in an operational military environment. Male volunteers in an armored division wore extended-wear soft contact lenses (SCLs) or spectacles for up to 6 months, participating fully in their units' normal activities. Responding to end-of-study questionnaires, most of the SCL wearers believed that they could see better with their SCLs than with spectacles. The great majority indicated contact lenses had improved their overall job performance, preferring SCLs for a variety of military activities. SCL-related environmental difficulties were reported frequently for conditions involving dust, wind, and smoke, whereas spectacle-related problems were common especially in the case of rain, dust, hot weather, or high humidity. Problems reported with handling and cleaning corrective lenses were more common among spectacle wearers than among SCL wearers.

INTRODUCTION

Spectacle-wearing soldiers frequently face special problems with equipment compatibility and environmental factors when performing their military tasks. Contact lenses, especially extended-wear lenses, offer an attractive option for solving these problems. However, only limited information has been published on

user acceptability and job performance impact of contact lens wear among military troops.¹⁻³

This study was conducted to assess the safety and use of soft contact lenses (SCLs) when worn by armor troops performing their normal duties. A previous report⁴ presented data on ocular physiology, success rates, and related clinical aspects. This report describes questionnaire findings regarding visual effectiveness, lens wear and care problems, impact on job performance, and interaction with environmental factors.

MATERIALS AND METHODS

Earlier reports^{4,5} provided details of the study's methodology. Male soldiers assigned to an armored division at Fort Hood, Texas, participated as volunteer subjects. Their ages ranged from 18 to 43 years. In all, 215 contact lens (CL) wearers and 96 spectacle wearers served in the study for up to 6 months while participating fully in their units' normal activities. Three different types of extended-wear SCLs were worn on a 7-day (plus or minus 1 day) schedule of continuous wear. Most of the subjects were crew members of tanks, combat vehicles (tracked personnel and weapons carriers), or air defense artillery weapons (antiaircraft missiles or guns).

At the end of the study, CL wearers completed questionnaires addressing user acceptability, wear and care

problems, military job performance, and problems in special environments. Spectacle wearers completed a separate questionnaire focusing on job/performance limitations and environmental or situational problems. In completing the questionnaires, subjects were asked to respond on the basis of their experience in the study. However, where CL wearers were asked to compare CLs with spectacles, presumably they relied in large measure on their previous experience with spectacles.

RESULTS AND DISCUSSION

Of the total group of subjects, 160 CL wearers and 84 spectacle wearers completed questionnaires. Not every individual answered every question. In reviewing and interpreting the questionnaire results, the reader should bear in mind two tempering considerations. First, the corrective lens frame of reference for CL subjects was different than for spectacle wearers, since most of the latter had no experience with CLs. This may have skewed responses of spectacle wearers where relative judgments about comfort, job performance difficulties, and the like were required. Second, the CL wearers generally may have been motivated to present a favorable picture of the contact lenses. This could have influenced them to underestimate lens-related problems.

Lens use and care problems Table 1 shows participants' responses on how often they experienced problems during the handling and care of corrective lenses. Inserting contact lenses was the only activity reported to be a periodic problem for more than 11% of the CL wearers. In contrast, both handling and cleaning were reported to be at least a periodic problem for 44% or more of the spectacle wearers. The majority of all participants reported handling and care problems to be moderately or highly acceptable.

Comfort Almost 90% of the CL wearers reported

their lenses were comfortable or very comfortable to wear. Only 50% of spectacle wearers gave this same response.

Table 2 presents the frequency of problems reported with discomfort from SCLs. Eye irritation, blurred vision, and light sensitivity were the complaints that more frequently caused problems for CL wearers. A substantial majority of CL wearers who encountered comfort-related problems found them to be minor.

Wearing schedule adherence A large majority (82%) of the CL wearers reported that they adhered to the recommended wearing schedule most of the time or always; 8% never or only once in a while adhered to the wearing schedule. About one in four CL wearers wore their lenses more than 10 days between cleanings on at least one occasion. A small percentage exceeded even this time frame. The maximum time reported between consecutive cleanings was 3 to 4 weeks for a few subjects.

Personal motivation Table 3 displays the attitudes of both groups toward their corrective lenses. More than 90% of the CL wearers liked their contact lenses moderately or very much. This contrasts with 18% of spectacle wearers who liked their spectacles moderately or very much. The reasons reported most often for spectacle dislike were that they got in the way, that they were uncomfortable, and that Army spectacles were "ugly."

The CL participants were queried as to their desire to continue wearing CLs beyond the end of the study. Ninety-four percent indicated that they would want to continue to wear contact lenses; 3% said that they would not want to continue, and 3% did not care.

Visual ability Both CL-wearing and spectacle-wearing participants were almost unanimously confident in their ability to see adequately (Table 4). However, more than three-fourths of the CL wearers were

TABLE 1
Lens Use and Care Problems

Activity	Never (%)	Seldom (%)	Sometimes (%)	Often (%)	Always (%)
CL Wearers (n = 160)					
Inserting	14	43	34	4	5
Removing	71	23	4	< 1	2
Handling	56	33	7	4	0
Cleaning	68	22	8	2	0
Disinfecting	80	15	3	1	< 1
Spectacle Wearers (n = 84)					
Handling	27	28	28	12	4
Cleaning	26	24	24	20	6

TABLE 2
Discomfort-Related Complaints (CL Wearers)

Complaint	Always (%)	Often (%)	Sometimes (%)	Seldom (%)	Never (%)
Eyelid irritation	< 1	1	13	29	56
Eye irritation	< 1	6	27	41	25
Eye pain	0	2	10	27	61
Blurred vision	2	8	33	37	20
Reduced tear flow	< 1	4	16	24	55
Light sensitivity	4	8	14	24	50

TABLE 3
Attitude Toward Wearing Corrective Lenses

Response	CL Wearers (%) (n = 160)	Spectacle Wearers (%) (n = 82)
Like very much	82	7
Like moderately	12	11
Neither like nor dislike	3	28
Dislike moderately	3	22
Dislike very much	0	32

TABLE 4
Confidence in Ability to See Adequately

Response	CL Wearers (%) (n = 160)	Spectacle Wearers (n = 83)
Highly confident	78	50
Moderately confident	22	46
Hardly confident	0	1
Not at all confident	< 1	4

¹Spectacle wearers were not given this response choice.

"highly confident," compared to half of the spectacle wearers. A large majority (79%) of the CL participants believed that they could see better with SCLs than with spectacles. Six percent of the CL wearers believed that they could see better with spectacles than with contact lenses.

The CL participants were asked to compare SCLs with spectacles in terms of visual ability afforded while performing various tasks. These tasks included sighting, aiming, and surveillance under different conditions. As can be seen in Table 5, the proportions of subjects judging they could see better with SCLs exceeded 75%

TABLE 5
Comparison of Contact Lenses vs. Spectacles for Task-Related Visual Ability

Task	CL Better (%)	Spectacles Better (%)	No Difference (%)
Sight/aim rifle	85	3	12
Sight/aim thru optics	91	3	6
Surveillance			
< 1000m, no optics	77	8	15
< 1000m, thru optics ¹	86	3	11
> 1000m, no optics	70	10	20
> 1000m, thru optics ¹	83	4	13
Read and write	63	8	28

¹Optical devices included binoculars, weapons system sights (e.g., tank sights), night vision goggles, and night sights.

for most of the tasks. The proportion of respondents favoring spectacles for the various tasks did not exceed 10%.

Job performance Eighty-five percent of the CL participants agreed that wearing SCLs had improved their overall job performance; only 3% believed it had not. When CL wearers compared SCLs with spectacles in terms of how much they helped in performing their duties, the response patterns seen in Table 6 emerged. For garrison duties (performed on or about the installation, as opposed to the field), 84% of the wearers felt SCLs were at least somewhat better than were spectacles. The overall figures were similar for field duties, although the relative proportion in the "much better" category declined. Fewer than 2% of the CL participants thought that spectacles were better than SCLs for performing garrison duties; this proportion climbed to 13% when field duties were considered. The less favorable ratings of SCLs for field duties most likely reflect lens-related difficulties (e.g., dust, cleaning problems) frequently encountered in the field.

All subjects were asked if they encountered difficulties when performing different job-related tasks such as vehicle operations, using weapon sights, and physical training. The proportion of CL wearers reporting

difficulties did not exceed 7%. The rate of CL removal associated with such difficulties was consistently small (less than 4%). Spectacle-wearing subjects reported substantial incidence (50–75%) of difficulties for several tasks, especially those involving physical activity or equipment requiring ocular compatibility (e.g., optical sights, night-vision goggles). In parallel fashion, frequent removal of spectacles occurred for several tasks.

When CL wearers were asked to indicate their preferences (SCLs or spectacles) for a variety of routine duties and physical training, the proportions preferring SCLs ranged between 90 and 95%, except for a simulated combat exercise with minimum sleep, where the proportion fell to 83%. The latter may be related to frequent lens-related difficulties encountered by CL wearers in the field.

Environmental factors When participants indicated whether different environmental conditions made wearing their corrective lenses difficult, the response patterns in Figure 1 resulted. Among CL wearers, the relative occurrence of environmentally linked difficulties was only slight to modest (less than 25%) in all but three conditions—dust, wind, and smoke from training devices. Dry air and tear gas also were somewhat problematic. Among spectacle wearers, the occurrence of

TABLE 6
Comparison of Contact Lenses vs. Spectacles for Performing Duties

Response	Garrison (%)	Field (%)
CL much better	71	59
CL somewhat better	13	21
No difference	14	7
Spectacles somewhat better	1	6
Spectacles much better	< 1	7

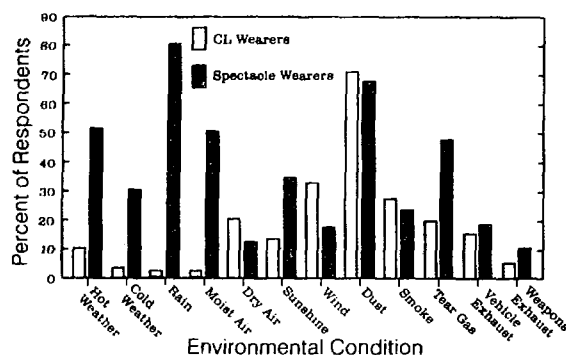


Figure 1. Percent of respondents reporting corrective lens-related difficulties associated with various environmental conditions (CL wearers, n = 160; spectacle wearers, n = 84).

environmental difficulties was substantial (greater than 30%) in seven of 12 conditions queried. Rain and dust were especially troublesome. The spectacle-related difficulties are understandable in terms of physical problems characteristic of spectacle lenses (rain or sweat streaking, fogging, dust coating, glare, etc.). The CL-related difficulties presumably are linked to ocular physiology (e.g., sensitivity to drying and airborne substances). The occurrence of difficulties during exposure to tear gas used in chemical defense training was substantially lower among CL wearers than among spectacle wearers. Kok-van-Alphen et al.⁶ have reported a similar finding in policemen.

Participants were asked to indicate whether they had encountered difficulties related to CL or spectacle wear during field training. Among the CL wearers, 34% reported difficulties in the field, compared to 7% for off-duty and garrison settings. These difficulties usually pertained to environmental factors (e.g., dust, wind, smoke) or problems with cleaning the CLs. Nearly one in three CL wearers reported substituting their spectacles in place of contact lenses during field training. Among the spectacle wearers, 44% said they experienced difficulties in the field, compared to 15% in garrison. Fifty-three percent of the spectacle wearers stated they had avoided wearing their spectacles on occasion, usually during field training or physical fitness training.

A majority (75% or greater) of CL wearers preferred CLs over spectacles for the environmental conditions represented in Figure 1, except for dusty environments. In the latter case, the proportion preferring CLs was 43%, with the same figure preferring spectacles.

CONCLUSIONS

The subjective findings obtained among armor troops in this study support the following major conclusions.

- 1) Nearly all the CL wearers and spectacle wearers were confident in their ability to see adequately.
- 2) Most of the CL wearers felt they could see better with their SCLs than with spectacles.
- 3) The great majority of CL wearers perceived SCLs had improved their overall job performance and preferred CLs for performing a variety of military activities.
- 4) CL wearers frequently reported problems with inserting their SCLs, while spectacle wearers commonly reported problems with handling and cleaning their spectacles.
- 5) Noncompliance with the recommended CL wearing/cleaning schedule was substantial.
- 6) Among CL participants, lens-related environmental difficulties were infrequent except for conditions involving dust, wind, and smoke from training devices. Spectacle wearers frequently reported environmental difficulties, especially for rain, dust, hot weather, and high humidity.

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References

1. McGraw, J.L., Enoch, J.M. *Contact Lenses: An Evaluation Study*. Fort Knox, KY, U.S. Army Medical Research Laboratory, USAMRL Report No. 99, 1952.
2. Nilsson, K., Rengstorff, R.H. Continuous Wearing of Duragel® Contact Lenses by Swedish Air Force Pilots. *Am. J. Optom. Physiol. Opt.* 56(6):356-358, 1979.
3. van Norren, D. Contact Lenses in the Military Service. *Am. J. Optom. Physiol. Opt.* 61(7):441-447, 1984.
4. Bachman, W.G., Leibrecht, B.C., Crosley, J.K., Price, D.R., Leas, P.M., Bentley, G.A. Six-Month Evaluation of Extended-Wear Soft Contact Lenses Among Armor Troops: Part I, Clinical Findings. *ICLC* 16:162-8.
5. Bachman, W.G., Leibrecht, B.C., Crosley, J.K., Price, D.R., Bentley, G.A., Leas, P.M. *An Operational Evaluation of Extended-Wear Soft Contact Lenses in an Armored Division*. Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory, USAARL Report No. 87-12, 1987.
6. Kok-van-Alphen, C., van der Linden, J., Visser, R., Bol, A. Protection of the Police Against Tear Gas With Soft Lenses. *Mil. Med.* 150:451-454, 1985.